Spot Safety Project Evaluation

Project Log # 200501234

Spot Safety Project # 09-96-210

Spot Safety Project Evaluation, of the Flashing Traffic Signal Installation at the Intersection of SR 1944 (Ridge Road/Enon Church Road) and SR 2048 (Woodleaf Road) in Rowan County

Documents Prepared By:

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Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 8/25/05
Samuel D. Coleman Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location
Evaluation of Spot Safety Project Number 09-96-210 – Intersection of SR 1944 (Ridge Road/Enon Church Road) and SR 2048 (Woodleaf Road) in Rowan County

Introduction

In an attempt to assess the safety of our roads, the Safety Evaluation Group of the Traffic Safety Systems Management Unit has evaluated the above project. The methodologies used in this evaluation offer various philosophies and ideas, in an effort to provide objective countermeasure crash reduction results. A naive before and after analysis of the treatment versus comparison data has been completed to measure the effectiveness of the spot safety improvement. This information is provided to you so the benefit or lack of benefit for this type of project can be recognized and utilized for future projects.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a flashing traffic signal. SR 1944 is a two-lane facility with no left turn lanes at the intersection with SR 2048. SR 2048 is also a two-lane facility with no left turn lanes. SR 2048 has a speed limit of 55 mph and SR 1944 has a speed limit of 45 mph. The intersection is controlled by stop signs on SR 1944 in the before period. The problem stated was that serious Frontal Impact crashes had occurred due to limited sight distance in the northwest quadrant. There were a total of 20 crashes during the initial study from 1/1/1992 – 1/1/1996, 19 Angle and 1 Rear-end crash. Previous countermeasures attempted were to have dual stop signs installed and move the stop bars closer to the intersection to help with visibility. The final completion date for the flashing traffic signal installation at the subject intersection was in September 1997.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from August 1997 through October 1997. The before period consisted of reported crashes from September 1, 1990 through July 31, 1997 (6 Years, 11 Months) and the after period consisted of reported crashes from November 1, 1997 through September 30, 2004 (6 Years, 11 Months). The ending date for this analysis was determined by the available crash data at the time the crash analysis was completed.

The analysis also consisted of two different sets of data, the treatment and the comparison data. The treatment data consisted of all crashes within 150 feet of the subject intersection. The comparison data consisted of all crashes within 150 feet at the intersection of SR 2048 and NC 801. The following data table depicts the Naive Before and After Analysis for the above information. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. These crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Treatment Information

	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	26	22	-15.4
Total Severity Index	16.9	11.9	-29.5
Frontal Impact Crashes	23	20	-13.0
Frontal Severity Index	18.4	12.7	-31.1
Volume	6700	9100	35.8

Comparison Information

	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	12	26	116.7
Total Severity Index	16.7	10.3	-38.7
Frontal Impact Crashes	9	24	166.7
Frontal Severity Index	21.1	10.4	-50.8
Volume	5500	7200	30.9

Odds Ratio: Treatment versus Comparison

	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Treatment Total Crashes	26	22	**-60.9**
Comparison Total Crashes	12	26	
Treatment F.I. Crashes	23	20	**-67.4**
Comparison F.I. Crashes	9	24	

The naive before and after analysis at the treatment location resulted in a 15.4 percent decrease in Total Crashes, a 13.0 percent decrease in Frontal Impact Crashes, and a 35.8 percent increase in Average Daily Traffic (ADT). The comparison locations resulted in a 116.7 percent increase in Total Crashes, a 166.7 percent increase in Frontal Impact Crashes, and a 30.9 percent increase in ADT. The before period ADT year was 1993 and the after period ADT year was 2000.

The Odds Ratio is used as another means of calculating the treatment effect. The total crashes in the before and after period from the Comparison Strip are used to calculate the percent reduction in total crashes for the Treatment Intersection. As shown in the table above, using the Odds Ratio calculation, there is a 60.9 percent decrease in Treatment Intersection crashes and a 67.4 percent decrease in Frontal Impact crashes.

Results and Discussion

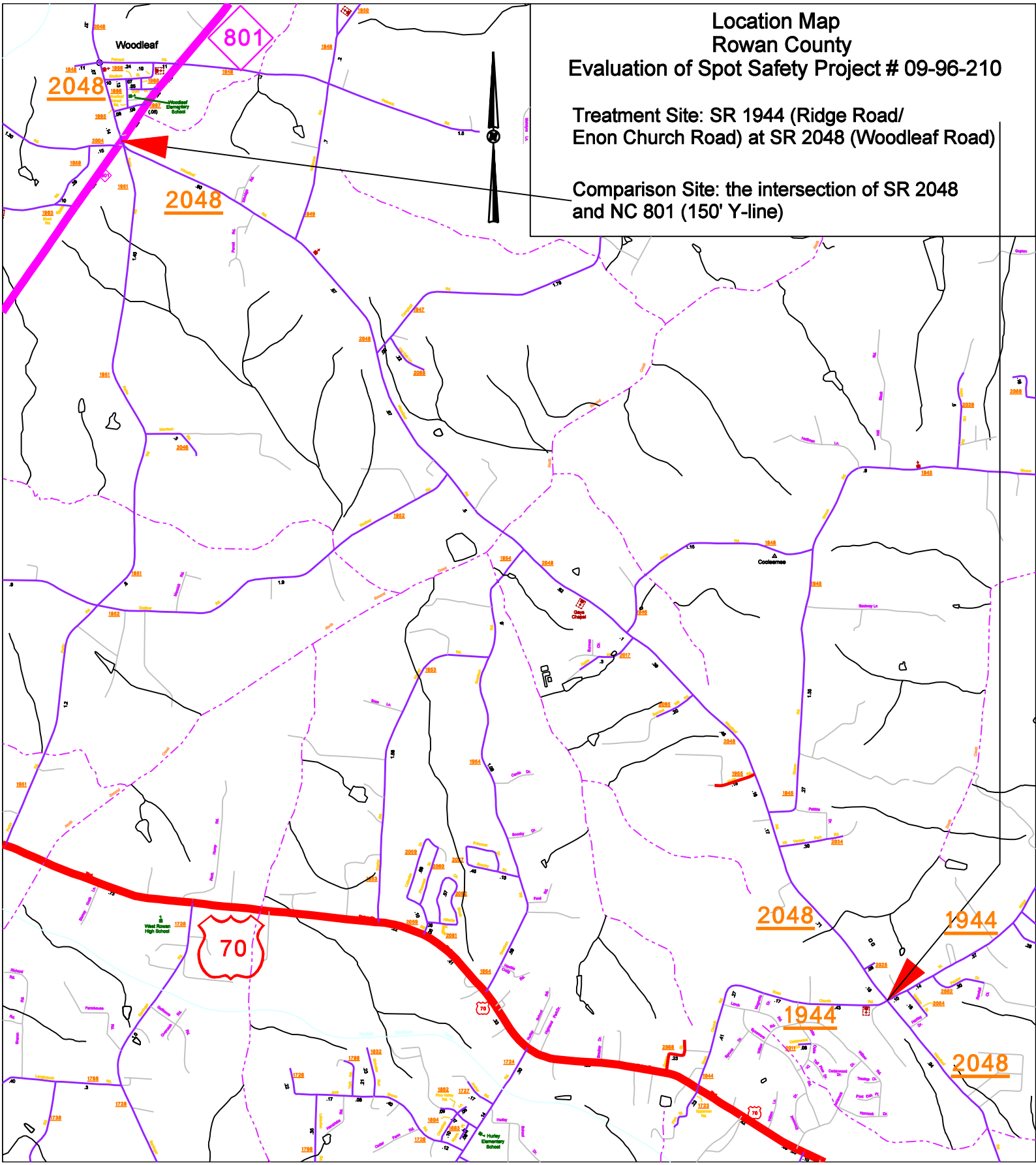
The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 15.4 percent decrease in Total Crashes and a 13.0 percent decrease in Frontal Impact Crashes. Using the Odds Ratio to calculate the treatment effect resulted in a 60.9 percent decrease in Total Crashes at the Treatment Intersection and a 67.4 percent decrease in Frontal Impact crashes. The summary results above demonstrate that the treatment location appears to have had a decrease in the number of Total Crashes and a decrease in the number of Frontal Impact Crashes from the before to the after period.

The traffic volume for the treatment intersection showed a significant increase of 35 percent. The number of crashes, along with the severity, was reduced. If there had been a "do nothing" option the crashes may have increased. This shows that the flasher installation brought attention to the intersection and may have helped to reduce crashes.

Again, referencing the crash analysis and table included, there is a reduction in total crashes from 26 to 22. The angle crashes were 23 in the before period and 20 in the after period. The north approach (Picture 1.) was noted to have a sight distance problem, attributing to 65 percent of the crashes in the before period and 50 percent in the after period. Further investigation may be needed of the northern approach to improve sight distance for safer operation.

The countermeasure crash reduction for Total Crashes at the subject intersection can be in the range of a 15.4 to a 60.9 percent decrease in crashes. The countermeasure crash reduction for Frontal Impact Crashes at the subject intersection can be in the range of a 13.0 to a 67.4 percent decrease in crashes. As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Picture 1. (North approach)


Location Map
Rowan County
Evaluation of Spot Safety Project # 09-96-210
Treatment Site: SR 1944 (Ridge Road/
Enon Church Road) at SR 2048 (Woodleaf Road)
Comparison Site: the intersection of SR 2048
and NC 801 (150' Y-line)
Woodleaf
801
2048
2048
70
2048
1944
1944
2048

Stop bar at west approach

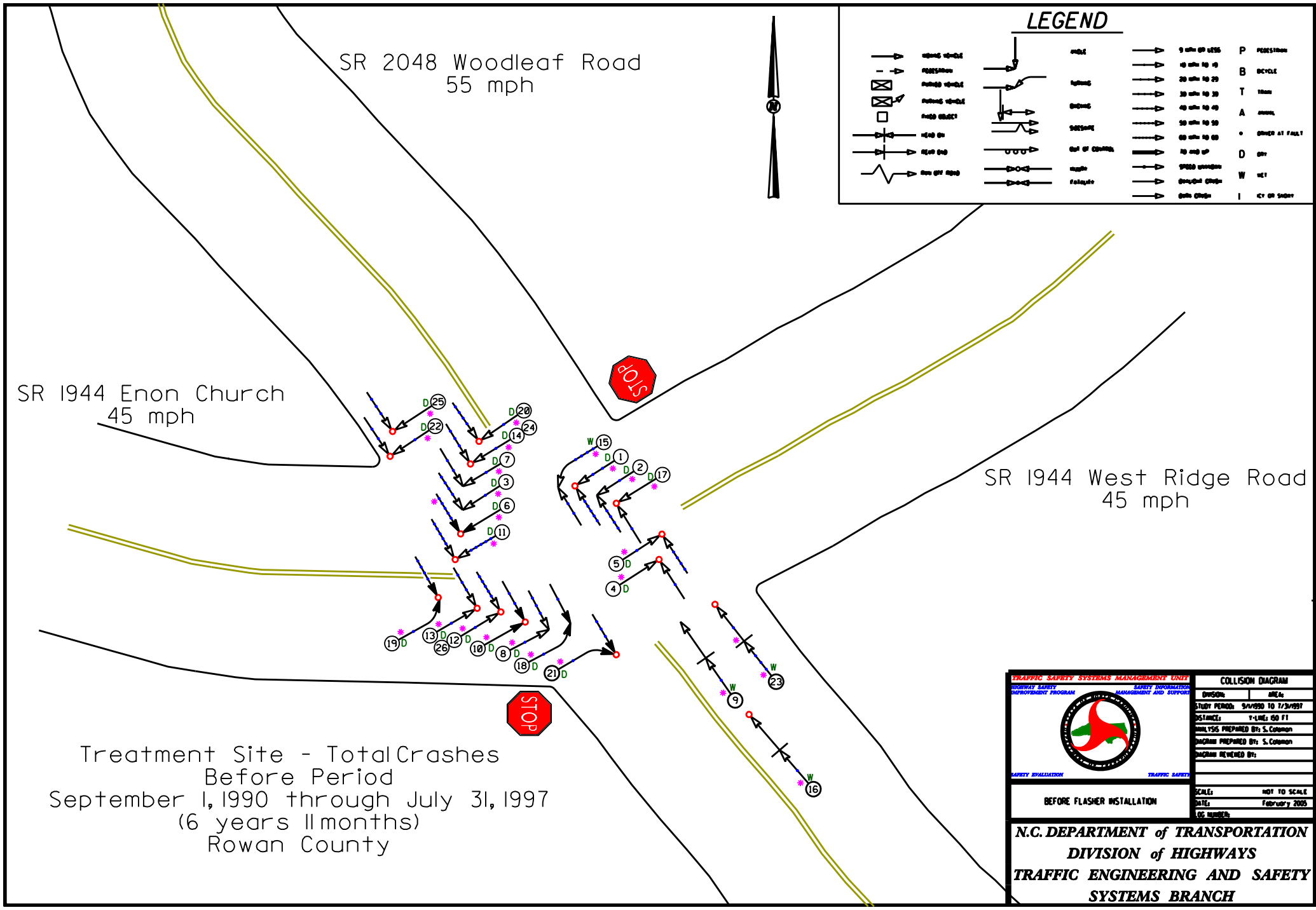
Stop bar at east approach

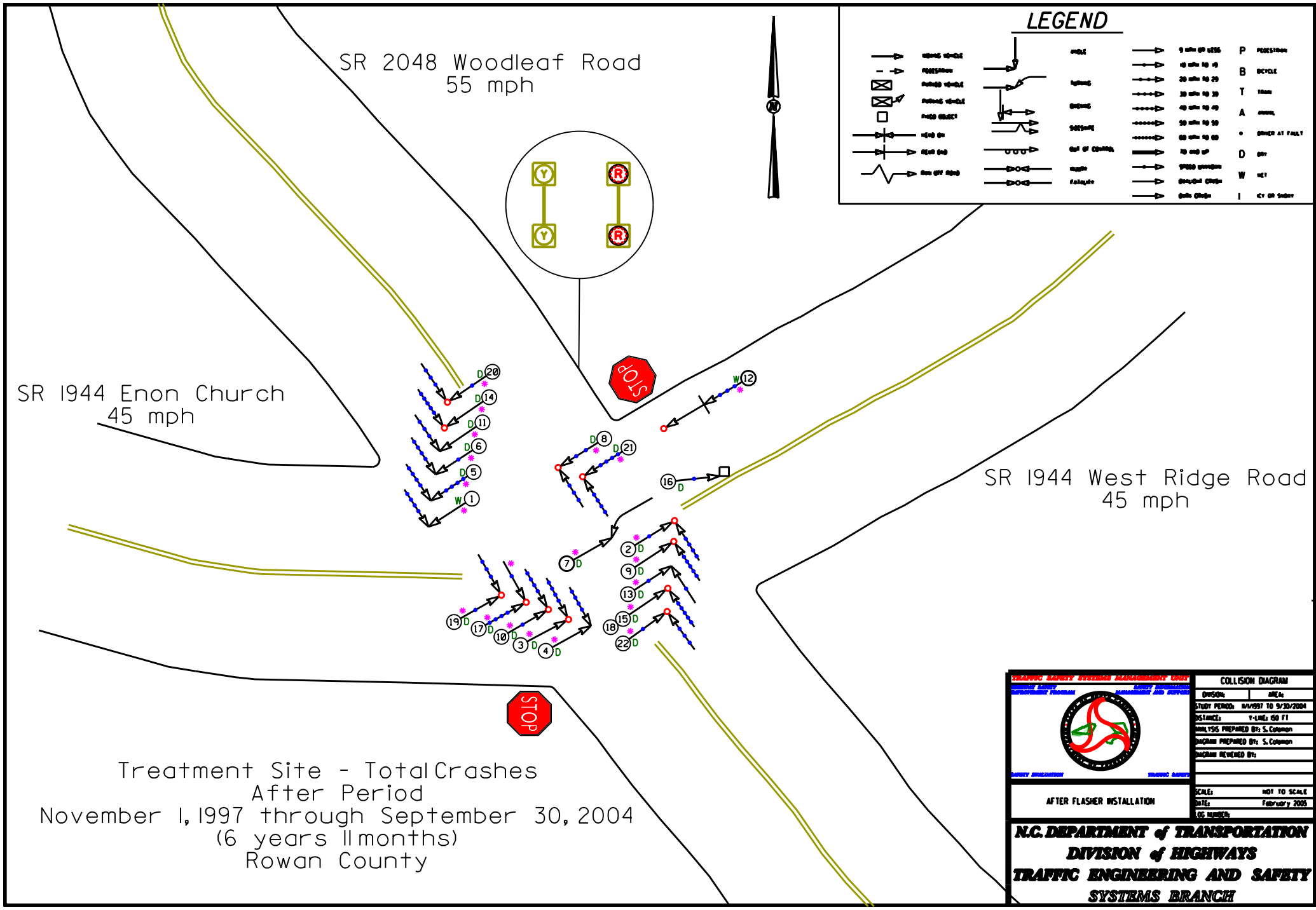
Stopped on east approach looking north

Stopped on west approach looking south

Stopped on west approach looking south


Stopped on west approach looking north


SR 2048 Woodleaf Road
55 mph
SR 1944 Enon Church
45 mph
SR 1944 West Ridge Road
45 mph
STOP
STOP
LEGEND
Treatment Site - Total Crashes
Before Period
September 1, 1990 through July 31, 1997
(6 years 11 months)
Rowan County
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT
HIGHWAY SAFETY IMPROVEMENT PROGRAM
SAFETY INFORMATION MANAGEMENT AND SUPPORT
SAFETY EVALUATION
TRAFFIC SAFETY
COLLISION DIAGRAM
DIVISION:
AREA:
STUDY PERIOD: 9/1/1990 TO 7/31/1997
DISTANCE: Y-LINE: 150 FT
ANALYSIS PREPARED BY: S. Coleman
DIAGRAM PREPARED BY: S. Coleman
DIAGRAM REVIEWED BY:
SCALE: NOT TO SCALE
DATE: February 2005
DG NUMBER:
BEFORE FLASHER INSTALLATION
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH


SR 2048 Woodleaf Road
55 mph
SR 1944 Enon Church
45 mph
SR 1944 West Ridge Road
45 mph
LEGEND
STOP
STOP
Treatment Site - Total Crashes
After Period
November 1, 1997 through September 30, 2004
(6 years 11 months)
Rowan County
COLLISION DIAGRAM
AFTER FLASHER INSTALLATION
N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY
SYSTEMS BRANCH